



***Limited Operational
Impact Study
For
Generation Interconnection
Request
GEN-2008-014***

***SPP Generation
Interconnection***

(#GEN-2008-014)

April 2011

Executive Summary

<OMITTED TEXT> (Customer) has executed an Interconnection Agreement under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnection of 150 MW of wind generation within the balancing authority of Southwestern Public Service (SPS) in Floyd County, Texas. SPP is not able to complete the required network upgrades in time for the Customer's requested in-service date of January 1, 2013. Therefore, Customer has requested this Limited Operation Impact Study (LOIS) to determine the impacts of interconnecting its generating facility to the transmission system before all required Network Upgrades identified in the ICS-2008-001-4 posted on December 21, 2010 can be placed into service. Limited Operation Studies are conducted under GIA Section 5.9 of the SPP OATT.

This study assumed that only those projects with queue priority equal to or over GEN-2008-014, which are identified in Table 3 of this study, might go into service before the completion of all Network Upgrades identified in ICS-2008-001-4. This study also assumed that all other additional generation projects with queue priority equal to or over GEN-2008-014, those listed in Table 4 of this report, will NOT go into commercial operation before the completion of all Network Upgrades identified in ICS-2008-001-4 study. If any of these projects go into commercial operation then this study must be conducted again to determine whether sufficient interconnection capacity exists to interconnect the GEN-2008-014 interconnection request in addition to all higher priority requests in operation or pending operation.

The wind generation facility was studied with Eighty-three (83) Vestas V-90 1.8 MW wind turbine generators. This Impact study addresses the thermal loading and dynamic stability effects of interconnecting the plant to the rest of the SPS transmission system for the system condition as it will be on January 1, 2013.

Power flow analysis studies included the prior queued projects listed in Table 3. The analysis showed that with system upgrades scheduled to be in-service prior to the requested service date, the customer's wind facility can interconnect its full 150.0 MW of generation capacity into the SPS transmission system. Powerflow analysis was based on both summer and winter peak conditions and light loading cases.

The power factor requirements for GEN-2008-014 are outlined in its Generation Interconnection Agreement.

The stability study results show that the transmission system remains stable for all simulated contingencies and conditions studied for the Customer facility with prior queued projects listed in Table 3. If the Customer changes generation technology, this LOIS will be considered invalid and the Customer will not be allowed to interconnect on a limited basis.

Two seasonal base cases were used in the study to analyze the stability impacts of the proposed generation facility. The cases studied were modified 2011 summer peak and 2011 winter peak cases that were adjusted to reflect system conditions at the requested in-service date. Each case was modified to include prior queued projects that are listed in the body of the report. Thirty-nine (39) contingencies were identified for use in this study. The Vestas V-90 1.8 MW wind turbines were modeled using information provided by the Customer.

In accordance with its Interconnection Agreement, the Customer must decide within 30 days of the posting of this study as to whether it will move forward to revise its GIA for a commercial operation date prior to the in service date of its required Network Upgrades.

The cost to interconnect on a limited basis is \$12,290,943.

Nothing in this study should be construed as a guarantee of transmission service. If the customer wishes to sell power from the facility, a separate request for transmission service shall be requested on Southwest Power Pool's OASIS by the Customer.

1.0 Introduction

<OMITTED TEXT> (Customer) has executed an Interconnection Agreement under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnection of 150.0 MW of wind generation within the balancing authority of Southwestern Public Service (SPS) in Floyd County, Texas. SPP is not able to complete the required network upgrades in time for the Customer's requested in-service date of January 1, 2013. Therefore, Customer has requested this Limited Operation Impact Study (LOIS) to determine the impacts of interconnecting its generating facility to the transmission system before all required Network Upgrades identified in the ICS-2008-001-4 posted on December 21, 2010 can be placed into service. Limited Operation Studies are conducted under GIA Section 5.9 of the SPP OATT.

This Impact study addresses the thermal loading and dynamic stability effects of interconnecting the plant to the rest of the SPS transmission system for the system condition as it will be on January 1, 2013. Two seasonal base cases were used in the study to analyze the stability impacts of the proposed generation facility. The cases studied were modified 2011 summer peak and 2011 winter peak cases that were adjusted to reflect system conditions at the requested in-service date. Each case was modified to include prior queued projects that are listed in the body of the report. Thirty-nine (39) contingencies were identified for use in this study. The Vestas V-90 1.8 MW wind turbines were modeled using information provided by the Customer.

2.0 Purpose

The purpose of this Limited Operational Impact Study (LOIS) is to evaluate the impact of the proposed interconnection on the reliability of the Transmission System. The LOIS considers the Base Case as well as all Generating Facilities (and with respect to (b) below, any identified Network Upgrades associated with such higher queued interconnection) that, on the date the LOIS is commenced:

- a) are directly interconnected to the Transmission System;
- b) are interconnected to Affected Systems and may have an impact on the Interconnection Request;
- c) have a pending higher queued Interconnection Request to interconnect to the Transmission System listed in Table 3; or
- d) have no Queue Position but have executed an LGIA or requested that an unexecuted LGIA be filed with FERC.

Any changes to these assumptions, for example, one or more of the previously queued projects not included in this study signing an interconnection agreement, may require a re-study of this request at the expense of the customer.

Nothing in this System Impact Study constitutes a request for transmission service or confers upon the Interconnection Customer any right to receive transmission service.

3.0 Facilities

3.1 Generating Facility

The project was modeled as an equivalent wind turbine generator of 150 MW output. The wind turbine is connected to an equivalent 0.7/34.5KV generator step unit (GSU). The high side of the GSU is connected to the 34.5/345kV substation transformer. A 345kV transmission line connects the Customer's substation transformer to the POI.

3.2 Interconnection Facility

The Point of Interconnection (POI) will be at a new 345kV substation on the Tuco – Oklaunion 345kV line. Figure 1 shows the facility and proposed POI at the proposed interim in-service date. Figure 2 shows the One Line to the Point of Interconnection.

Cost to interconnect on a limited basis is estimated at \$12,290,943.

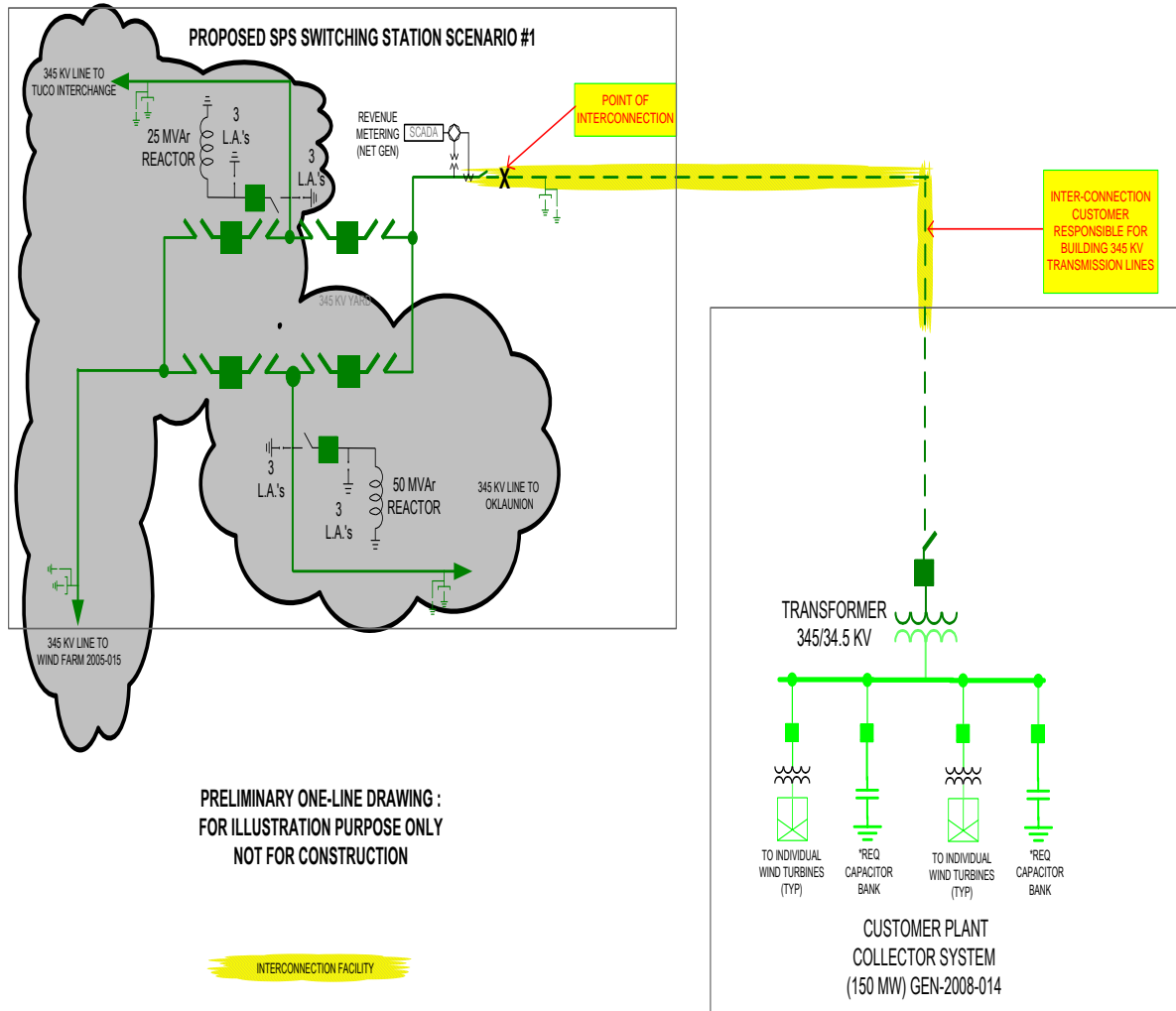


Figure 1: GEN-2008-014 Facility and Proposed Interconnection Configuration

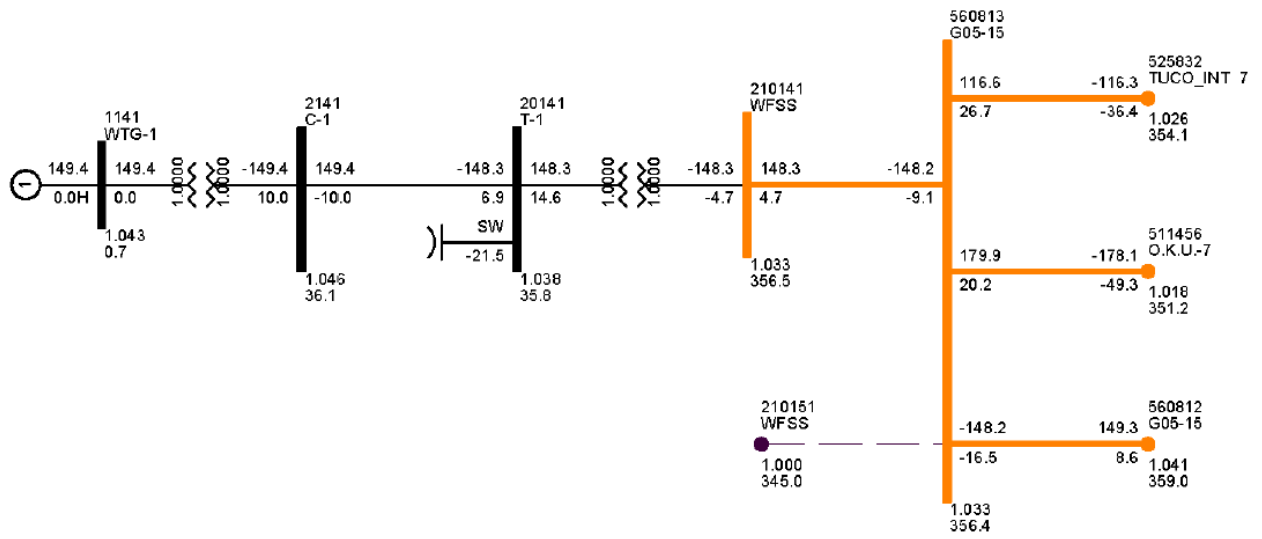


Figure 2: GEN-2008-014 One Line Bus Interconnection

4.0 Power Flow Analysis

A powerflow analysis was conducted for the Interconnection Customer's facility using a modified version of the 2011 spring, 2012 summer, and 2012 winter seasonal models. The output of the Interconnection Customer's facility was offset in the model by a reduction in output of existing online SPP generation. This method allows the request to be studied as an Energy Resource (ERIS) Interconnection Request. This analysis was conducted assuming that previous queued requests listed in Table 3 were in-service.

The Southwest Power Pool (SPP) Criteria states that:

"The transmission system of the SPP region shall be planned and constructed so that the contingencies as set forth in the Criteria will meet the applicable NERC Reliability Standards for transmission planning. All MDWG power flow models shall be tested to verify compliance with the System Performance Standards from NERC Table 1 – Category A."

The ACCC function of PSS/E was used to simulate single contingencies in portions of or all of the control area of SPS and other control areas within SPP and the resulting data analyzed. This satisfies the "more probable" contingency testing criteria mandated by NERC and the SPP criteria.

Higher queued projects listed in Table 4 were not modeled as in service. If any of these come in service, this study will need to be performed again to determine if any limited operation service is available.

The ACCC analysis indicates that as a result of the Customer's project at full nameplate power the SPS transmission system will not experience thermal overloads with higher queued projects listed in Table 3 modeled as in service. These analysis results are listed in Table 1.

Table 1: ACCC Analysis

| SOURCE | SCENARIO | SEASON | DIRECTION | MONTCOMMONNAME | RATEB | TDF | TC%LOADING | CONTNAME |
|--------|----------|--------|-----------|----------------|-------|-----|------------|----------|
| | | | | none | | | | |

5.0 Power Factor Analysis

The power factor requirements for GEN-2008-014 are outlined in its Generation Interconnection Agreement.

6.0 Stability Analysis

6.1 Contingencies Simulated

Thirty-nine (39) contingencies were considered for the transient stability simulations. These contingencies included three phase and single phase transmission line faults and transformer faults at locations defined by SPP. Single-phase line faults were simulated by applying a fault impedance to the positive sequence network at the fault location to represent the effect of the negative and zero sequence networks on the positive sequence network. The fault impedance was computed to give a positive sequence voltage at the specified fault location of approximately 60% of pre-fault voltage. This method is in agreement with SPP current practice.

The faults that were defined and simulated are listed below in Table 2.

Table 2: Fault Definitions

| Cont. No. | Cont. Name | Description |
|-----------|------------|---|
| 1 | FLT01-3PH | 3 phase fault on the Eddy Co. 230kV (527800) to 345kV (527802) transformer, near the 230kV bus. a. Apply fault at the Eddy Co. 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer. |
| 2 | FLT03-3PH | 3 phase fault on the Tolk 230kV (525543) to 345kV (525549) transformer, near the 230kV bus. a. Apply fault at the Tolk 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer. |
| 3 | FLT05-3PH | 3 phase fault on the Tolk E (525524) to Tuco (525830) 230kV line, near Tolk E. a. Apply fault at the Tolk E 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault. |
| 4 | FLT06-1PH | <i>Single phase fault and sequence like previous</i> |
| 5 | FLT07-3PH | 3 phase fault on the Grassland (526676) to Lynn Co. (526656) 115kV line, near Grassland. a. Apply fault at the Grassland 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault. |
| 6 | FLT08-1PH | <i>Single phase fault and sequence like previous</i> |

| Cont. No. | Cont. Name | Description |
|-----------|------------|---|
| 7 | FLT09-3PH | 3 phase fault on the Grassland 230kV (526677) to 115kV (526676) transformer, near the 230kV bus. a. Apply fault at the Grassland 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer. |
| 8 | FLT11-3PH | 3 phase fault on the Grassland (526677) to Borden (526830) 230kV line, near Grassland. a. Apply fault at the Grassland 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault. |
| 9 | FLT12-1PH | <i>Single phase fault and sequence like previous</i> |
| 10 | FLT13-3PH | 3 phase fault on the Grassland (526677) to Jones (526338) 230kV line, near Grassland. a. Apply fault at the Grassland 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault. |
| 11 | FLT14-1PH | <i>Single phase fault and sequence like previous</i> |
| 12 | FLT15-3PH | 3 phase fault on the Jones (526338) to Lubbock E (526299) 230kV line, near Jones Bus2. a. Apply fault at the Jones 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault. |
| 13 | FLT17-3PH | 3 phase fault on the Jones (526337) to Tuco (525830) 230kV line, near Jones Bus1. a. Apply fault at the Jones 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault. |
| 14 | FLT18-1PH | <i>Single phase fault and sequence like previous</i> |
| 15 | FLT19-3PH | 3 phase fault on the Tuco (525830) to Swisher (525213) 230kV line, near Tuco. a. Apply fault at the Tuco 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault. |
| 16 | FLT20-1PH | <i>Single phase fault and sequence like previous</i> |
| 17 | FLT21-3PH | 3 phase fault on the Tuco 230kV (525830) to 345kV (525832) transformer, near the 230kV bus. a. Apply fault at the Tuco 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer. |

| Cont. No. | Cont. Name | Description |
|-----------|------------|--|
| 18 | FLT23-3PH | 3 phase fault on the GEN-2005-015 (560813) to Tuco (525832) 345kV line, near GEN-2005-015. a. Apply fault at the GEN-2005-015 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault. |
| 19 | FLT24-1PH | <i>Single phase fault and sequence like previous</i> |
| 20 | FLT25-3PH | 3 phase fault on the GEN-2005-015 (560813) to Oklaunion (511456) 345kV line, near GEN-2005-015. a. Apply fault at the GEN-2005-015 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. |
| 21 | FLT26-1PH | <i>Single phase fault and sequence like previous</i> |
| 22 | FLT27-3PH | 3 phase fault on the Roosevelt S (524911) to Tolk E.(525524) 230kV line, near Roosevelt S. a. Apply fault at the Roosevelt S 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault. |
| 23 | FLT28-1PH | <i>Single phase fault and sequence like previous</i> |
| 24 | FLT29-3PH | 3 phase fault on the San Juan (524885) to Oasis (524875) 230kV line, near Oasis. a. Apply fault at the Oasis 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault. |
| 25 | FLT30-1PH | <i>Single phase fault and sequence like previous</i> |
| 26 | FLT31-3PH | 3 phase fault on the Tolk East (525524) to Plant X (525481) 230kV line, near Tolk East. a. Apply fault at the Tolk East 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. |
| 27 | FLT32-1PH | <i>Single phase fault and sequence like previous</i> |
| 28 | FLT33-3PH | 3 phase fault on the Plant X (525481) to Deafsmith (524623) 230kV line, near Deafsmith. a. Apply fault at the Deafsmith 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault. |
| 29 | FLT34-1PH | <i>Single phase fault and sequence like previous</i> |
| 30 | FLT35-3PH | 3 phase fault on the Plant X (525481) to Sundown (526435) 230kV line, near Sundown. a. Apply fault at the Sundown 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault. |
| 31 | FLT36-1PH | <i>Single phase fault and sequence like previous</i> |

| Cont. No. | Cont. Name | Description |
|-----------|------------|--|
| 32 | FLT37-3PH | 3 phase fault on the Lamb County (525637) to Tolk West (525531) 230kV line, near Lamb County. a. Apply fault at the Lamb County 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault. |
| 33 | FLT38-1PH | <i>Single phase fault and sequence like previous</i> |
| 34 | FLT39-3PH | 3 phase fault on the Yoakum (526935) to Tolk West (525531) 230kV line, near Yoakum. a. Apply fault at the Yoakum 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault. |
| 35 | FLT40-1PH | <i>Single phase fault and sequence like previous</i> |
| 36 | FLT41-3PH | 3 phase fault on the Finney (523853) to Holcomb (531449) 345kV line, near Finney. a. Apply fault at the Finney 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault. |
| 37 | FLT42-1PH | <i>Single phase fault and sequence like previous</i> |
| 38 | FLT43-3PH | 3 phase fault on the Elk City (511490) to Sweetwater (511541) 230kV line, near Elk City. a. Apply fault at the Elk City 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault. |
| 39 | FLT44-1PH | <i>Single phase fault and sequence like previous</i> |

6.2 Further Model Preparation

The base cases contain higher or equally queued projects as shown in Table 3.

The wind generation from the study customer and the previously queued customers were dispatched into the SPP footprint.

Initial simulations were carried out on both base cases and cases with the added generation for a no-disturbance run of 20 seconds to verify the numerical stability of the model. All cases were confirmed to be stable.

Table 3: Prior Queued Projects Included

| Project | MW |
|----------------|-----|
| Llano Estacado | 80 |
| GEN-2001-033 | 180 |
| GEN-2001-036 | 80 |
| GEN-2002-008 | 120 |
| GEN-2002-009 | 80 |
| GEN-2002-022 | 240 |
| GEN-2003-020 | 80 |
| GEN-2006-018 | 170 |
| GEN-2006-044 | 250 |
| GEN-2008-008 | 60 |
| GEN-2010-006 | 205 |
| ASGI-2010-010 | 42 |

The projects in Table 4 are higher or equally queued projects that are not included in this analysis. If any of these projects request to come into service during limited operation, this study will need to be re-performed to determine if any limited operation is available.

Table 4: Prior Queued Projects Not Included

| Project | MW |
|--------------|-----|
| GEN-2002-008 | 120 |
| GEN-2003-020 | 80 |
| GEN-2006-039 | 400 |
| GEN-2006-045 | 240 |
| GEN-2006-047 | 240 |
| GEN-2006-044 | 120 |
| GEN-2008-009 | 60 |
| GEN-2008-016 | 248 |

6.3 Results

Results of the stability analysis are summarized in Table 5. The results indicate that for all contingencies studied the transmission system remains stable with the inclusion of equally or higher queued projects listed in Table 3.

Table 5: Results of Simulated Contingencies

| Cont. No. | Cont. Name | Description | 2011 Summer | 2011 Winter |
|-----------|------------|---|-------------|-------------|
| 1 | FLT01-3PH | 3 phase fault on the Eddy Co. 230kV (527800) to 345kV (527802) transformer, near the 230kV bus. | Stable | Stable |
| 2 | FLT03-3PH | 3 phase fault on the Tolk 230kV (525543) to 345kV (525549) transformer, near the 230kV bus. | Stable | Stable |
| 3 | FLT05-3PH | 3 phase fault on the Tolk E (525524) to Tuco (525830) 230kV line, near Tolk E. | Stable | Stable |
| 4 | FLT06-1PH | <i>Single phase fault and sequence like previous</i> | Stable | Stable |

| Cont. No. | Cont. Name | Description | 2011 Summer | 2011 Winter |
|-----------|------------|--|-------------|-------------|
| 5 | FLT07-3PH | 3 phase fault on the Grassland (526676) to Lynn Co. (526656) 115kV line, near Grassland. | Stable | Stable |
| 6 | FLT08-1PH | <i>Single phase fault and sequence like previous</i> | Stable | Stable |
| 7 | FLT09-3PH | 3 phase fault on the Grassland 230kV (526677) to 115kV (526676) transformer, near the 230kV bus. | Stable | Stable |
| 8 | FLT11-3PH | 3 phase fault on the Grassland (526677) to Borden (526830) 230kV line, near Grassland. | Stable | Stable |
| 9 | FLT12-1PH | <i>Single phase fault and sequence like previous</i> | Stable | Stable |
| 10 | FLT13-3PH | 3 phase fault on the Grassland (526677) to Jones (526338) 230kV line, near Grassland. | Stable | Stable |
| 11 | FLT14-1PH | <i>Single phase fault and sequence like previous</i> | Stable | Stable |
| 12 | FLT15-3PH | 3 phase fault on the Jones (526338) to Lubbock E (526299) 230kV line, near Jones Bus2. | Stable | Stable |
| 13 | FLT17-3PH | 3 phase fault on the Jones (526337) to Tuco (525830) 230kV line, near Jones Bus1. | Stable | Stable |
| 14 | FLT18-1PH | <i>Single phase fault and sequence like previous</i> | Stable | Stable |
| 15 | FLT19-3PH | 3 phase fault on the Tuco (525830) to Swisher (525213) 230kV line, near Tuco. | Stable | Stable |
| 16 | FLT20-1PH | <i>Single phase fault and sequence like previous</i> | Stable | Stable |
| 17 | FLT21-3PH | 3 phase fault on the Tuco 230kV (525830) to 345kV (525832) transformer, near the 230kV bus. | Stable | Stable |
| 18 | FLT23-3PH | 3 phase fault on the GEN-2005-015 (560813) to Tuco (525832) 345kV line, near GEN-2005-015. | Stable | Stable |
| 19 | FLT24-1PH | <i>Single phase fault and sequence like previous</i> | Stable | Stable |
| 20 | FLT25-3PH | 3 phase fault on the GEN-2005-015 (560813) to Oklaunion (511456) 345kV line, near GEN-2005-015. | Stable | Stable |
| 21 | FLT26-1PH | <i>Single phase fault and sequence like previous</i> | Stable | Stable |
| 22 | FLT27-3PH | 3 phase fault on the Roosevelt S (524911) to Tolk E.(525524) 230kV line, near Roosevelt S. | Stable | Stable |
| 23 | FLT28-1PH | <i>Single phase fault and sequence like previous</i> | Stable | Stable |
| 24 | FLT29-3PH | 3 phase fault on the San Juan (524885) to Oasis (524875) 230kV line, near Oasis. | Stable | Stable |
| 25 | FLT30-1PH | <i>Single phase fault and sequence like previous</i> | Stable | Stable |
| 26 | FLT31-3PH | 3 phase fault on the Tolk East (525524) to Plant X (525481) 230kV line, near Tolk East. | Stable | Stable |
| 27 | FLT32-1PH | <i>Single phase fault and sequence like previous</i> | Stable | Stable |
| 28 | FLT33-3PH | 3 phase fault on the Plant X (525481) to Deafsmith (524623) 230kV line, near Deafsmith. | Stable | Stable |
| 29 | FLT34-1PH | <i>Single phase fault and sequence like previous</i> | Stable | Stable |

| Cont. No. | Cont. Name | Description | 2011 Summer | 2011 Winter |
|-----------|------------|---|-------------|-------------|
| 30 | FLT35-3PH | 3 phase fault on the Plant X (525481) to Sundown (526435) 230kV line, near Sundown. | Stable | Stable |
| 31 | FLT36-1PH | <i>Single phase fault and sequence like previous</i> | Stable | Stable |
| 32 | FLT37-3PH | 3 phase fault on the Lamb County (525637) to Tolk West (525531) 230kV line, near Lamb County. | Stable | Stable |
| 33 | FLT38-1PH | <i>Single phase fault and sequence like previous</i> | Stable | Stable |
| 34 | FLT39-3PH | 3 phase fault on the Yoakum (526935) to Tolk West (525531) 230kV line, near Yoakum. | Stable | Stable |
| 35 | FLT40-1PH | <i>Single phase fault and sequence like previous</i> | Stable | Stable |
| 36 | FLT41-3PH | 3 phase fault on the Finney (523853) to Holcomb (531449) 345kV line, near Finney. | Stable | Stable |
| 37 | FLT42-1PH | <i>Single phase fault and sequence like previous</i> | Stable | Stable |
| 38 | FLT43-3PH | 3 phase fault on the Elk City (511490) to Sweetwater (511541) 230kV line, near Elk City. | Stable | Stable |
| 39 | FLT44-1PH | <i>Single phase fault and sequence like previous</i> | Stable | Stable |

6.4 FERC LVRT Compliance

FERC Order #661A places specific requirements on wind farms through its Low Voltage Ride Through (LVRT) provisions. For Interconnection Agreements signed after December 31, 2006, wind farms shall stay on line for faults at the POI that draw the voltage down at the POI to 0.0 pu.

Two fault contingencies were developed to verify that the wind farm will remain on line when the POI voltage is drawn down to 0.0 pu. These contingencies are shown in Table 6.

Table 6: LVRT Fault Contingencies

| Cont. Name | Description |
|------------|---|
| FLT23-3PH | 3 phase fault on the GEN-2005-015 (560813) to Tuco (525832) 345kV line, near GEN-2005-015. a. Apply fault at the GEN-2005-015 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault. |
| FLT25-3PH | 3 phase fault on the GEN-2005-015 (560813) to Oklaunion (511456) 345kV line, near GEN-2005-015. a. Apply fault at the GEN-2005-015 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault. |

The project wind farm remained online for the fault contingency described in this section and for all the fault contingencies described in section 6.1. GEN-2008-014 is found to be in compliance with FERC Order #661A.

7.0 Conclusion

<OMITTED TEXT> (Customer) has requested a Limited Operation Impact Study for interconnection service of 150 MW of wind generation within the balancing authority of Southwestern Public Service in Floyd County, Texas, in accordance with Section 5.9 of the SPP GIA.

The results of this study show that the wind generation facility and the transmission system remain stable for all contingencies studied. Also, GEN-2008-014 is found to be in compliance with FERC Order #661A.

With the inclusion of only the equally or higher queued projects listed in Table 3, limited operation can be accommodated before the inclusion of all the network upgrades listed in ICS-2008-001-4 are completed.

The power factor requirements for GEN-2008-014 are outlined in its Generation Interconnection Agreement.

The projects in Table 4 are higher or equally queued projects that are not included in this analysis. If any of these projects come into service, this study will need to be re-performed to determine if any limited operation capacity is available.

The estimated costs for network upgrades and interconnection facilities for limited operation are estimated at \$12,290,943.

These estimates do not include any costs associated with the deliverability of the energy to final customers. These costs are determined by separate studies if the Customer requests transmission service through Southwest Power Pool's OASIS. It should be noted that the models used for simulation do not contain all SPP transmission service.